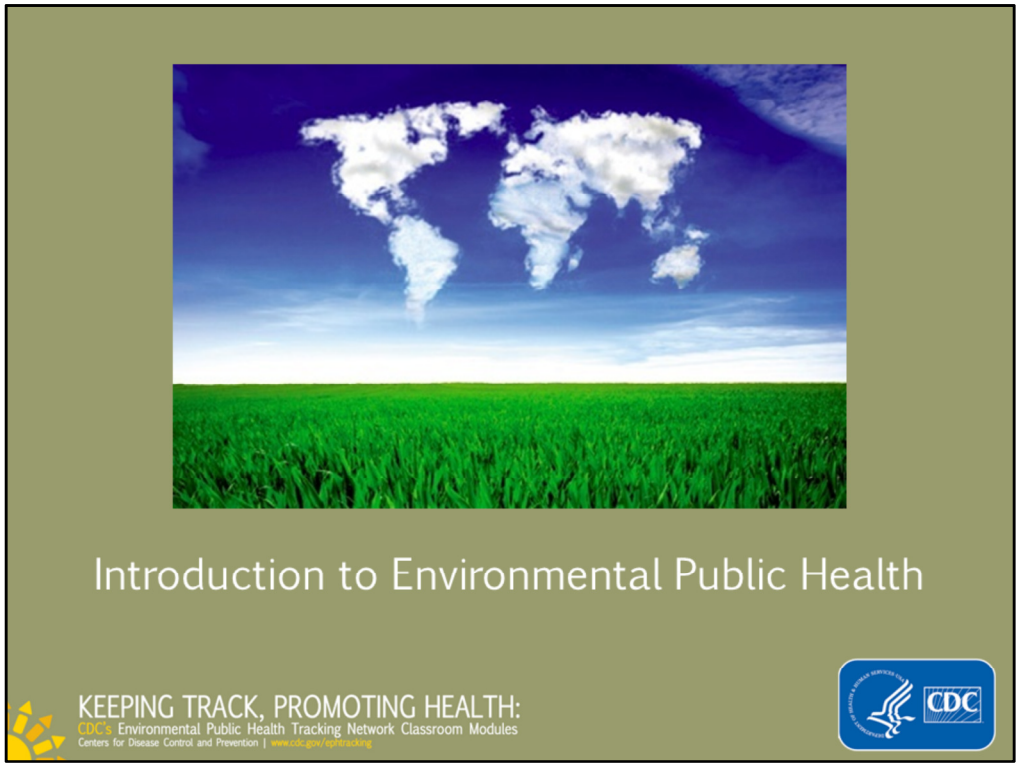


Today we're kicking off a lesson about environmental health.

This first lecture is designed to improve your understanding about how the environment affects public health. First, we will discuss the field of environmental health and its impact on public health. Then we will review the types of research and monitoring that researchers and public health officials have to build on our knowledge of environmental health risks.

This lesson will provide context for the next lesson, in which I will teach you about an environmental health resource from CDC. This resource, called the National Environmental Public Health Tracking Network, provides access to data that you can use to examine the environment's effect on health. It's a valuable research tool you can use throughout your studies and your career.

Preview

- Environmental Health Overview
- Role of Environmental Health in Public Health
- Monitoring Environmental Public Health
- Career Opportunities

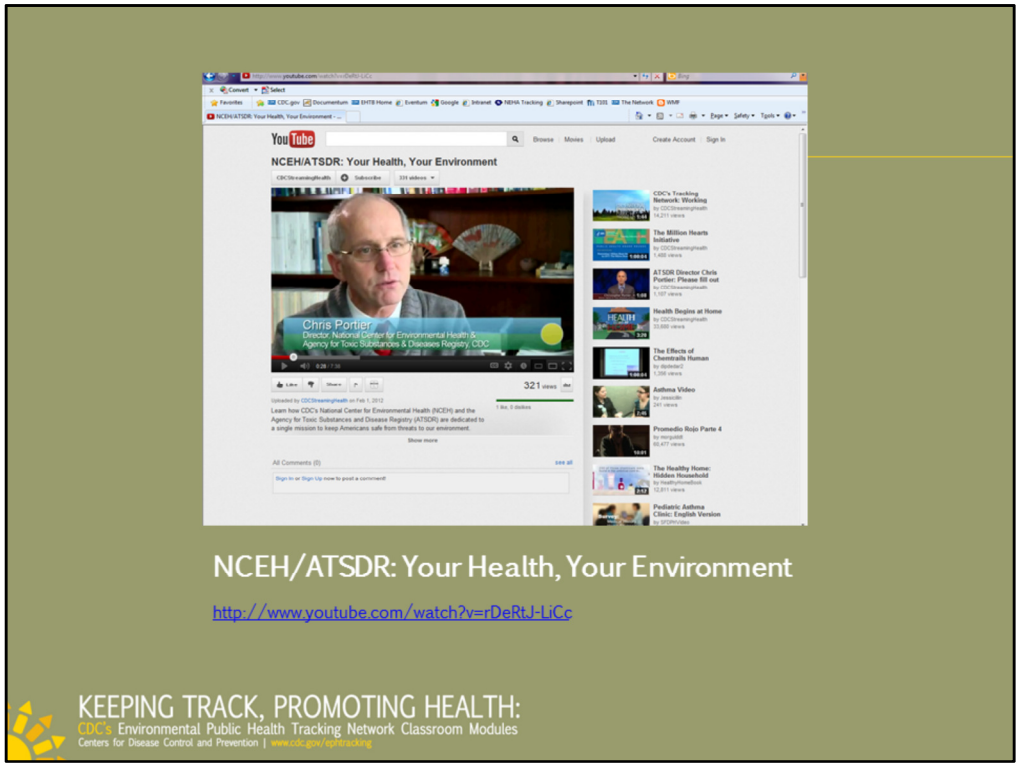
KEEPING TRACK, PROMOTING HEALTH:
CDC's Environmental Public Health Tracking Network Classroom Modules
Centers for Disease Control and Prevention | www.cdc.gov/ephtracking

Here's how CDC's National Center for Environmental Health defines environmental health: "environmental health is the discipline that focuses on the interrelationships between people and their environment, promotes human health and well-being, and fosters a safe and healthful environment" [SOURCE: Introduction section of the book, Environmental Health – From Global to Local, editor Howard Frumkin 2005].

There is no question that the environment impacts the health of individuals and communities. It is easy for us to grasp that chemical spills in our water supply has an impact on the safety of the water we drink; the understanding of all of the environmental factors - physical, chemical, and biological factors external to a person – is a special field within the world of public health.

Environmental factors or hazards like water and air pollution, extreme weather, or chemical exposures can impact human health in a number of ways, from contributing to chronic diseases like asthma, developmental disabilities, and cancer or acute illnesses like heat exhaustion, food, carbon monoxide, and childhood lead poisoning.

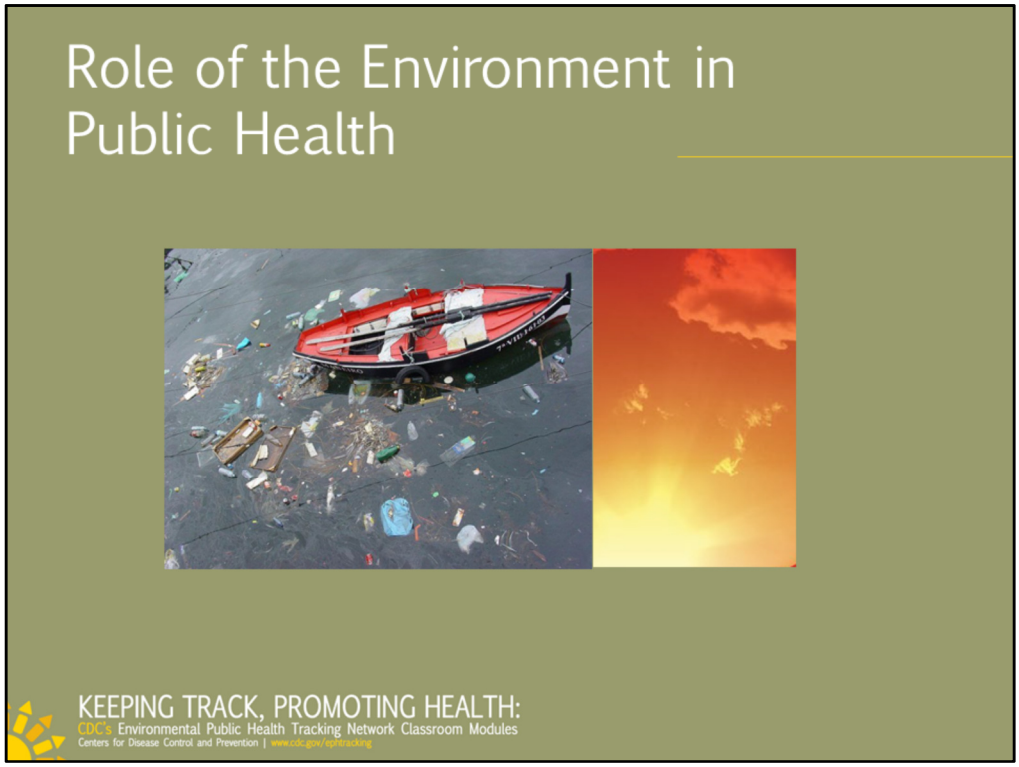
IMAGES:
- http://ephtracking.cdc.gov/showBuildEnvironment.action
- http://ephtracking.cdc.gov/showAirData.action



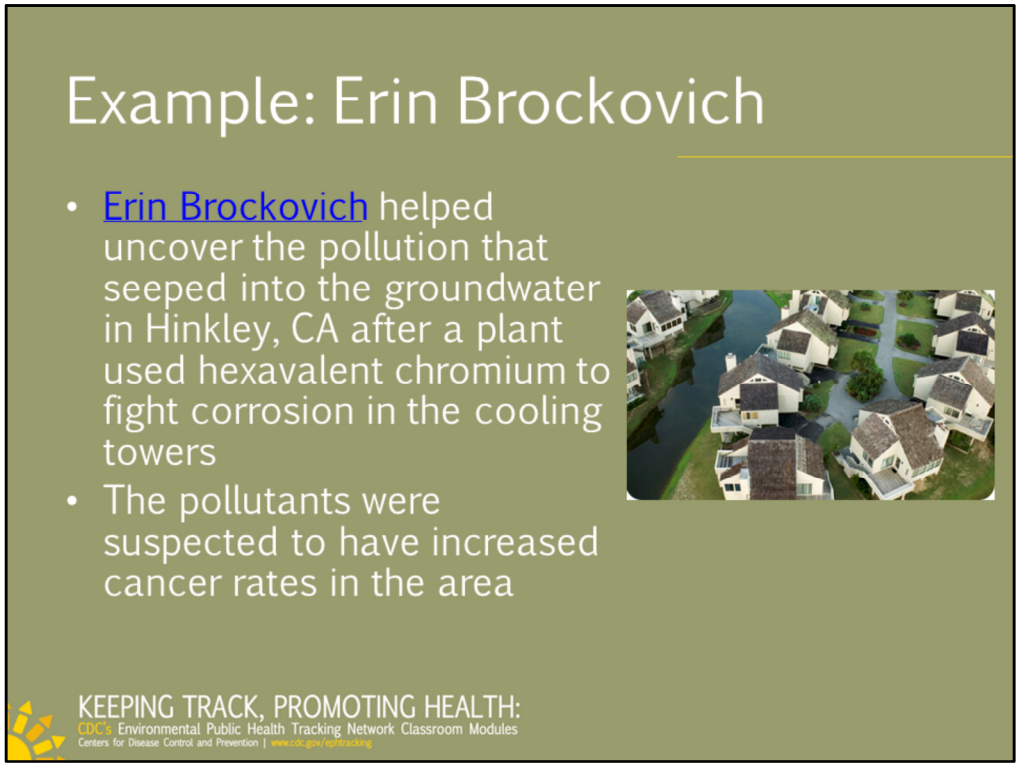
OPTION 1: To set the stage and give you a sense for the practice of environmental public health, let's watch this video from CDC's National Center for Environmental Health about the work they do: http://www.youtube.com/watch?v=rDeRtJ-LiCc

Focused on the work that CDC does specifically, the video shows real-life examples of how research is being conducted and applied to protect people's health from environmental hazards.

OPTION 2: Search the Web for other environmental health video clips. Examples: news shows, documentaries, TV episodes, movies



Let's go deeper into the role of the environment in public health.



Who here has seen the movie Erin Brockovich? It's a real-life environmental health story about a woman who helped spearhead a case alleging contamination of drinking water with hexavalent chromium, also known as chromium(VI), was causing cancer in the southern California town of Hinkley.

Between 1952 and 1966, PG&E used hexavalent chromium in its cooling towers to fight corrosion. The wastewater dissolved the hexavalent chromium from the cooling towers and was discharged to unlined ponds at the site. Some of the wastewater percolated into the groundwater, affecting an area near the plant.

Erin Brockovich helped uncover the pollution and its suspected impact on cancer rates in the area. What she found out led to a record-breaking settlement for a group of class-action plaintiffs in 1996.

SOURCE: http://en.wikipedia.org/wiki/Erin_Brockovich and IMAGE: http://ephtracking.cdc.gov/showWaterLanding.action

An **environmental health hazard** is a substance that has the ability to cause an adverse health event. This includes physical, chemical, and biological factors that are external to a person. Hazards can be natural or manmade.

Examples include:
Air, water, and soil pollution from transportation, agriculture, industry, and other sources such as:

- Chemicals
- Toxic waste
- Radiation
- Disease-causing microorganisms and plants
- Pesticides
- Heavy metals
- Climate
- Extreme temperatures and weather events
- Where you live – home and community design
- Chemicals in consumer products

SOURCE: MD_What is Environmental Healthpowerpoints.pdf and Image: http://ephtracking.cdc.gov/showRiskLandingSolution.action

DISCUSSION QUESTIONS:

What environmental hazards do you follow or are you most concerned about?

What do you think is the most significant environmental health issue facing our state? (NOTE: Use CDC's Environmental Public Health Tracking Network to understand this)

Health effects from the environment can be both short term (**acute**) and longer term (**chronic**).

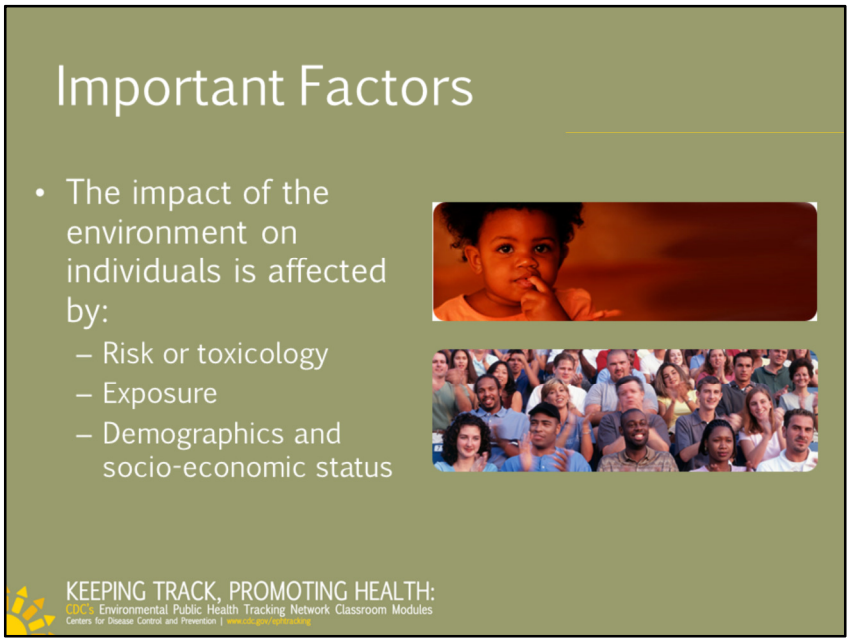
Science has proven some links between health conditions and the environment.
- For example, we know poor air quality can trigger asthma, and that elevated blood lead levels in children can cause developmental disabilities.
- We know that vulnerable populations like the elderly and infants are most at risk to heat-related illnesses during heat waves, and that other extreme weather that causes power outages can lead to cases of carbon monoxide poisoning.

However, many links are suspected but not yet proven—environmental health is a complicated area of study and there are gaps in information about how the environment affects chronic diseases. Health problems with suspected links to environmental issues include:
- Certain cancers (i.e., bladder, liver)
- Asthma and other respiratory diseases
- Neurological (related to the nervous system) diseases
- Parkinson's disease, multiple sclerosis, Alzheimer's disease
- Developmental disabilities, such as cerebral palsy, autism, etc.

SOURCES: MD_What is Environmental Healthpowerpoints.pdf and http://ephtracking.cdc.gov/showHealthEffects.action

IMAGES:
- http://ephtracking.cdc.gov/showBirthDefects.action
- http://ephtracking.cdc.gov/showAsthma.action

ACTIVITY IDEA: Assign students a disease, give them 10 minutes to research it online and ask them to report back to the class on what is known or being studied about the connection between the condition and the environment.



When assessing trends and data about an environmental hazard and its affect on health, it is important to consider multiple factors that may impact the information you're analyzing, including a population's risk, exposure, and demographics.

Risk and exposure: Populations are at increased risk of carbon monoxide poisoning during extreme weather events like ice storms or floods and hurricanes that can cause power outages. Without power, people may use charcoal or gas grills indoors to cook, exposing them to carbon monoxide through the air they breathe. While everyone in the home may be exposed to the gas, not everyone will get carbon monoxide poisoning. The likelihood of poisoning depends on the amount of CO a person is exposed to, how long a person is exposed to CO, and an individual's characteristics like age or having chronic health problems.

Demographics: As mentioned with CO poisoning, personal characteristics can affect a person's health. A person's gender, age, race and ethnicity, and socioeconomic factors, such as poverty, can effect the health impact caused by the environment. Although the association between population characteristics and the environment is difficult to measure, some research has shown that these factors do affect a person's exposure to environmental hazards.

Examples: [SOURCE: http://ephtracking.cdc.gov/showPopCharEnv.action]
- Racial minorities and low-income populations are more likely to live near hazardous waste sites and in areas with high air pollution and poor housing conditions.
- Low-income populations, minorities, and children living in inner cities have more emergency department visits, hospitalizations, and deaths resulting from asthma than the general population.
- In New York, people living within a half mile of toxic land sites were 66% more likely to be hospitalized for asthma, 30% more likely to be poor, and 13% more likely to be a member of a minority group than people outside the half mile radius.

I've touched on it a bit, but can anyone here elaborate and explain to the class the issue of **health disparities?**

The nation's health status will never be as good as it can be as long as there are segments of the population with poor health status. Current information about the biologic and genetic characteristics of minority and underserved populations does not explain the health disparities experienced by these groups.
Public health officials are working to better understand disparities in health-care access, exposure to environmental hazards, mortality, morbidity, behavioral risk factors, disability status, and social determinants of health at the national level in order to eliminate health disparities for vulnerable populations (as defined by race/ethnicity, socio-economic status, geography, gender, age, disability status, risk status related to sex and gender, and among other populations identified to be at-risk for health disparities).

SOURE and additional reading: http://www.cdc.gov/omhd/Topic/HealthDisparities.html and
http://www.cdc.gov/minorityhealth/CHDIReport.html

IMAGES:
- http://ephtracking.cdc.gov/showBiomonitoringLanding.action
- http://ephtracking.cdc.gov/showDevelopmentalDisabilitiesExposureRisk.action

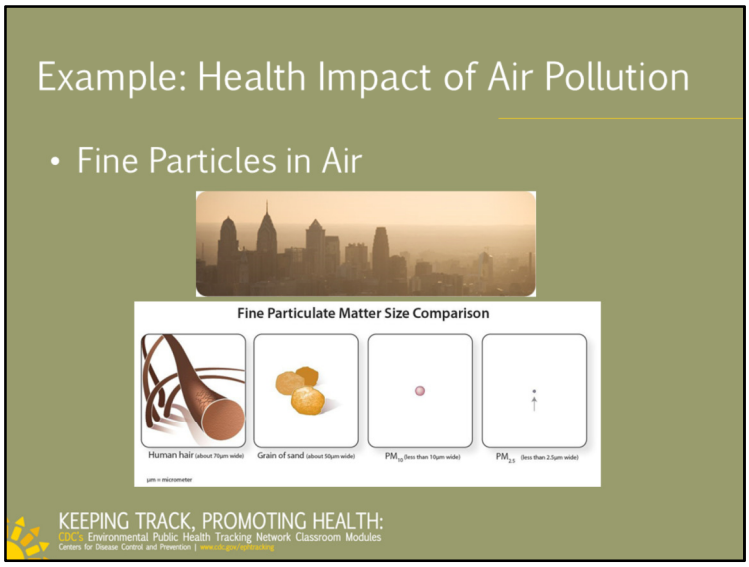
Another example that illustrates exposure and risk: http://ephtracking.cdc.gov/showDevelopmentalDisabilitiesExposureRisk.action

Why do we care to understand connections between the environment and health? Prevention. The more we know about the health consequences of an environmental hazard, the better we can protect public health through policies, education, and community outreach programs.

For example, the state of Maine found that almost every case of carbon monoxide (CO) poisoning in the state was associated with not having a CO detector. These data led to new legislation requiring CO detectors in all rental units, in single family homes when there is an addition or renovation, and whenever a property is sold. [SOURCE and IMAGE: http://www.cdc.gov/nceh/tracking/success/maine.htm#reducing]

Also, knowing that the elderly are among the most vulnerable to heat illness during a heat wave has lead to community outreach programs nationwide that educate citizens about the importance of checking on elderly family and neighbors during an extreme heat event. [SOURCE: http://www.bt.cdc.gov/disasters/extremeheat/index.asp and IMAGE: http://www.cdc.gov/nceh/extremeheat/materials.html]

And to prevent childhood lead poisoning, health departments and advocacy groups promote tips like: only drink cold water from the tap, practice safe remodeling processes to remove lead paint, and advise getting your children's blood tested if you think they've been exposed. [SOURCE: http://ephtracking.cdc.gov/showChildhoodLeadPrevention.action]



Let's consider this example, which brings together key points we've covered so far. (OPTIONAL: Provide handout titled 'EXAMPLE 1' for students to follow along)

Health Impacts of Fine Particles in Air

Particles in the air such as dust, dirt, soot, and smoke are one kind of air pollution that is known to cause health problems. Particles in the air come from many different sources. The composition of these particles can vary based on location, season, and whether they are from primary or secondary sources. Primary sources give off particulate matter directly. For example, forest fires, road dust, electrical power plants, industrial processes, and cars and trucks are primary sources. Secondary sources give off gases that react with sunlight and water in the air to form particles. Coal-fired power plants and exhaust from cars and trucks are common secondary sources.

Very small particles that are less than 2.5 micrometers in width are known as fine particulate matter or $PM_{2.5}$. These particles are less than 1/30 the width of a human hair. Fine particulates can play a role in causing serious illnesses and death because they are small enough to be inhaled deep into the lungs. Once fine particles are in the lungs, they can affect the heart, blood vessels, and lungs.

People exposed to fine particles over a long period of time have more heart and lung problems than people who are not breathing this kind of air pollution. Lowering PM levels would prevent deaths, mostly from heart attacks and heart disease. Studies have shown a 15% decrease in the risk of heart disease deaths with every $PM_{2.5}$ decrease of $10ug/m^3$ (micrograms per cubic meter).

Some communities may be more at risk for heart and lung problems related to air pollution because of social and environmental issues such as:

- High rates of poverty
- High numbers of people without health insurance
- Race and ethnicity of the neighborhood
- High rates of smoking
- Higher amounts of car and truck exhaust due to greater population density
- Factory emissions
- High numbers of young children and adults over the age of 65

These risk factors are associated with more heart and lung problems, hospital visits, and deaths in areas with high amounts of air pollution. Information about risk factors can be used together with air pollution data to help public health officials plan and deliver the right help to communities.

SOURCE and IMAGE: http://ephtracking.cdc.gov/showAirHIA.action

OPTIONAL ADDITIONAL READING AND HANDOUT:
NYC Air Quality Impact 2011
http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/planyc_2011_air_quality.pdf
Res Rep Health Eff Inst. 2009 May;(140):5-114; discussion 115-36.

Extended follow-up and spatial analysis of the American Cancer Society study linking particulate air pollution and mortality.
Krewski D, Jerrett M, Burnett RT, Ma R, Hughes E, Shi Y, Turner MC, Pope CA 3rd, Thurston G, Calle EE, Thun MJ, Beckerman B, DeLuca P, Finkelstein N, Ito K, Moore DK, Newbold KB, Ramsay T, Ross Z, Shin H, Tempalski B.
http://www.ncbi.nlm.nih.gov/pubmed/19627030

How do we know what we know about the environment's effect on health?

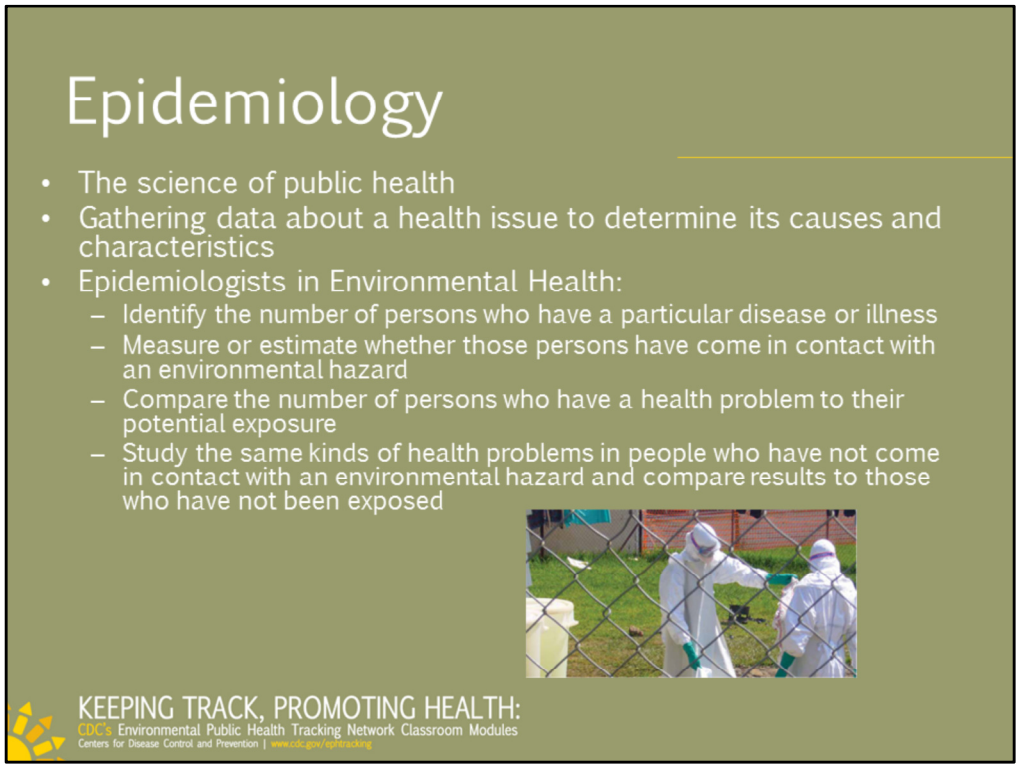
We have data.

Why don't we know more? Why aren't all suspected links proven?

Getting quality and complete data is a complex task.

I'm going to talk about the process of collecting environment and health data, cover key concepts, and introduce different types of environmental hazard and health effect data available today.

We are going to cover the science of epidemiology and surveillance, laws and policy, as well as building a career in public health.



Who here knows what epidemiology is? Does anyone here want to be an epidemiologist?

Since environmental health is a relatively new practice—research is a priority. There is a lot of research and data collection that still needs to be done so we can make solid assessments and connections. That's why I wanted to touch on epidemiology.

Epidemiology has been characterized as the basic science of public health. Epidemiology is defined by CDC as:

- The study of the origin and causes of diseases in a community, and
- The scientific method of investigation problem–solving used by disease detectives—epidemiologists, laboratory scientists, statisticians, physicians and other health care providers, and public health professionals—to get to the root of health problems and outbreaks in a community.

In the field, epidemiologists respond to emergent events like be they newly emerging infections, natural disasters, or terrorism-and study public health problems, such as unintentional injuries, environmental exposures, cardiovascular disease, obesity, tobacco use, and violence. They work domestically and internationally.

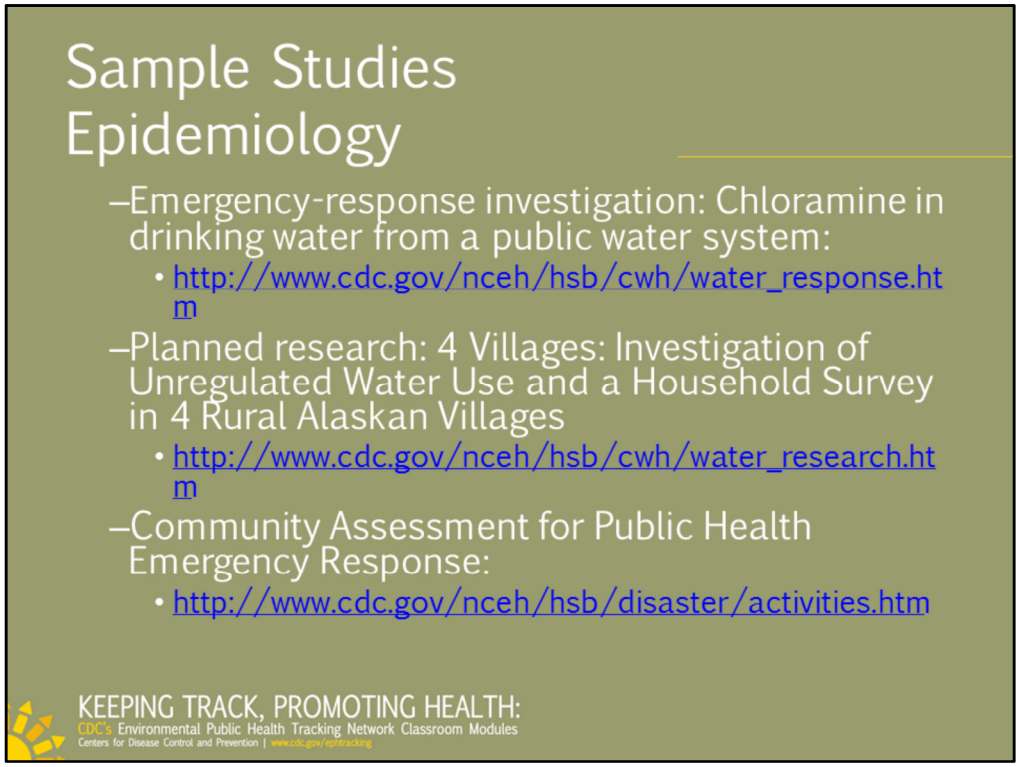
Many of the scientists you saw in the CDC video earlier are epidemiologists.

Examples of the work epidemiologists in environmental health do include:

- Identify the number of persons who have a particular disease or illness
- Measure or estimate whether those persons have come in contact with an environmental hazard
- Compare the number of persons who have a health problem to their potential exposure to see if there is a relationship
- Study the same kinds of health problems in people who have not come in contact with an environmental hazard and compare results to those that have been exposed

SOURCES and for additional Epidemiology course work and information: http://www.cdc.gov/excite/classroom/intro_epi.htm and http://www.cdc.gov/24-7/CDCFastFacts/epidemiology.html

IMAGE: http://www.cdc.gov/24-7/CDCFastFacts/epidemiology.html

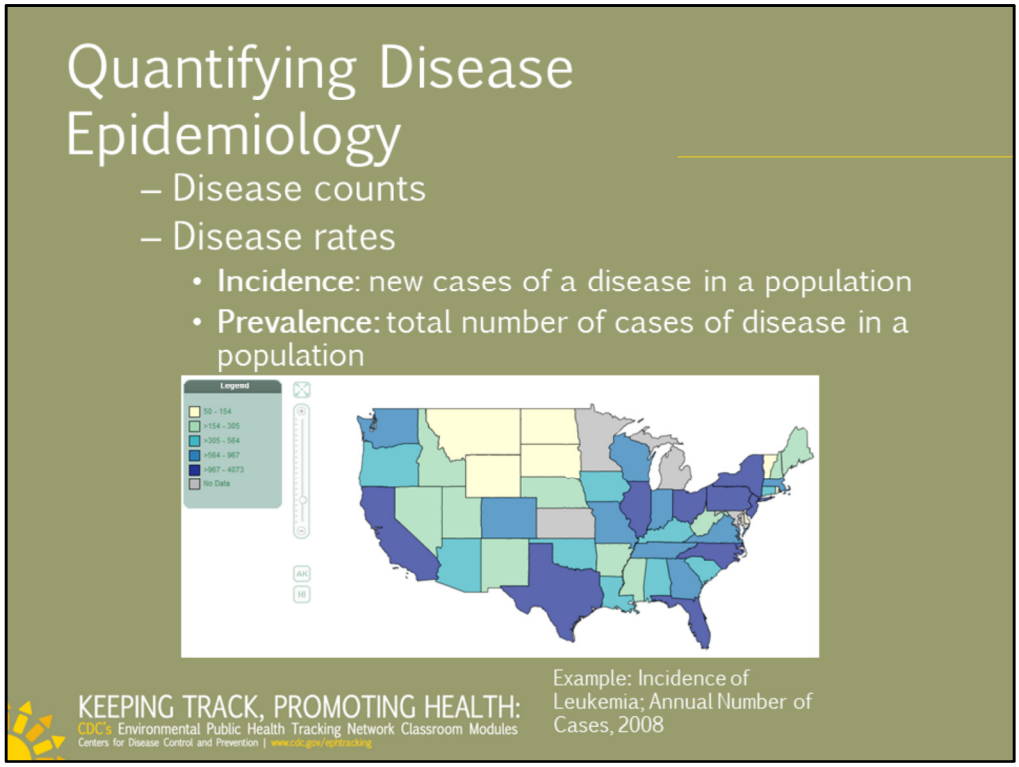


OPTIONAL SLIDE:

To better understand what epidemiologists do, let's review a few example studies together:

- Emergency-response investigation: Chloramine in drinking water from a public water system: http://www.cdc.gov/nceh/hsb/cwh/water_response.htm
- Planned research: 4 Villages: Investigation of Unregulated Water Use and a Household Survey in 4 Rural Alaskan Villages
  http://www.cdc.gov/nceh/hsb/cwh/water_research.htm
- Community Assessment for Public Health Emergency Response:
  http://www.cdc.gov/nceh/hsb/disaster/activities.htm

[SOURCE: For more information and epidemiology study examples:
http://www.cdc.gov/nceh/hsb/]



I want to make a note about how epidemiologists quantify disease.

Absolute counts of the incidence of disease is important, but just relying on counts makes it difficult for comparisons to be made. The bigger a population, the larger the number of cases is likely to be. One way to account for this is to consider the number of cases in relation to the population as a whole. Several statistical approaches are possible for determining disease rates. Here are two examples:

Incidence is a measure of disease that allows us to determine a person's probability of being diagnosed with a disease during a given period of time. Simply stated, incidence is the number of newly diagnosed cases of a disease. An incidence rate is the number of new cases of a disease divided by the number of persons at risk for the disease. If, over the course of one year, five women are diagnosed with breast cancer out of a total female study population of 200 (who do not have breast cancer at the beginning of the study period), then we would say the incidence of breast cancer in this population was 0.025. (or 2,500 per 100,000 women-years of study)

Prevalence is a measure of disease that allows us to determine a person's likelihood of having a disease. The number of prevalent cases is the total number of cases of disease existing in a population. A prevalence rate is the total number of cases of a disease existing in a population divided by the total population. So, if a measurement of cancer is taken in a population of 40,000 people and 1,200 were recently diagnosed with cancer and 3,500 are living with cancer, 4,700 of the 40,000 are counted for a prevalence rate of cancer at 0.118. (or 11,750 per 100,000 persons).

SOURCES:
- Definitions: http://www.health.ny.gov/diseases/chronic/basicstat.htm
- Map: http://ephtracking.cdc.gov/QueryPanel/EPHTNQuery/EPHTQuery.html?c=9&i=20&m=-1#

Public health surveillance is the continuous, systematic collection, analysis, and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.

Public health surveillance data can be displayed in different ways such as maps, charts, or tables, and can be used to:
- serve as an early warning system for impending public health emergencies;
- document the impact of an intervention, or track progress towards specified goals; and
- monitor and clarify the epidemiology of health problems to allow priorities to be set and to inform public health policy and strategies.

QUESTION: Can anyone name an example of a public health surveillance system? CDC's Environmental Public Health Tracking Network which we're going to explore in depth is one. It is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. It is a way of incorporating data for analysis and reporting.
Other examples of public health surveillance systems are the Behavioral Risk Factor Surveillance System (BRFSS) and the National Notifiable Diseases Surveillance System (NNDSS).

BRFSS: The Behavioral Risk Factor Surveillance System (BRFSS) is the world's largest, on-going telephone health survey system, tracking health conditions and risk behaviors in the United States yearly since 1984. Currently, data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam. http://www.cdc.gov/brfss/

NNDSS: In 1961, CDC assumed responsibility for the collection and publication of data concerning nationally notifiable diseases. http://www.cdc.gov/osels/ph_surveillance/nndss/nndsshis.htm

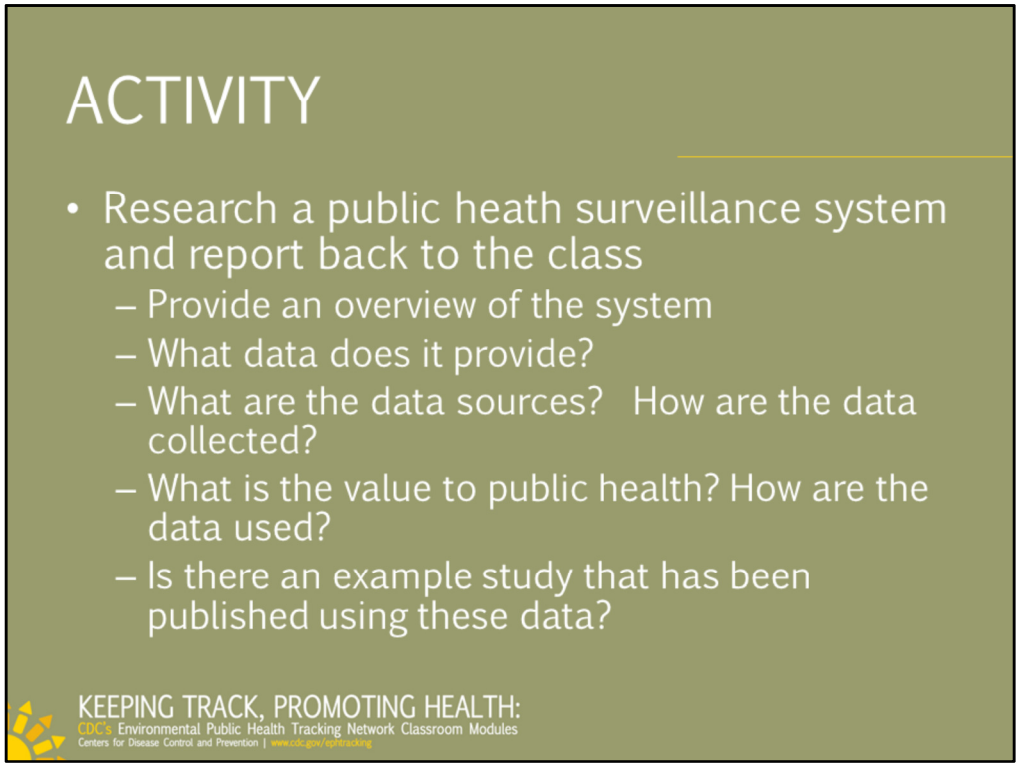
SOURCE: Nsubuga P, White ME, Thacker SB, et al. Public Health Surveillance: A Tool for Targeting and Monitoring Interventions. In: Jamison DT, Breman JG, Measham AR, et al., editors. Disease Control Priorities in Developing Countries. 2nd edition. Washington (DC): World Bank; 2006. Chapter 53. Available from: http://www.ncbi.nlm.nih.gov/books/NBK11770/

IMAGES:
- http://www.cdc.gov/osels/ph_surveillance/nndss/nndsshis.htm
- http://www.cdc.gov/brfss/
- http://ephtracking.cdc.gov/

OPTIONAL READING: **CDC's Vision for Public Health Surveillance in the 21st Century**
http://www.cdc.gov/mmwr/pdf/other/su6103.pdf
Contents:
- Introduction
- Public Health Surveillance in the United States: Evolution and Challenges
- Lexicon, Definitions, and Conceptual Framework for Public Health Surveillance
- Global Health Surveillance
- The Role of Public Health Informatics in Enhancing Public Health Surveillance
- Public Health Surveillance Workforce of the Future
- Public Health Surveillance Data: Legal, Policy, Ethical, Regulatory, and Practical Issues
- Analytical Challenges for Emerging Public Health Surveillance

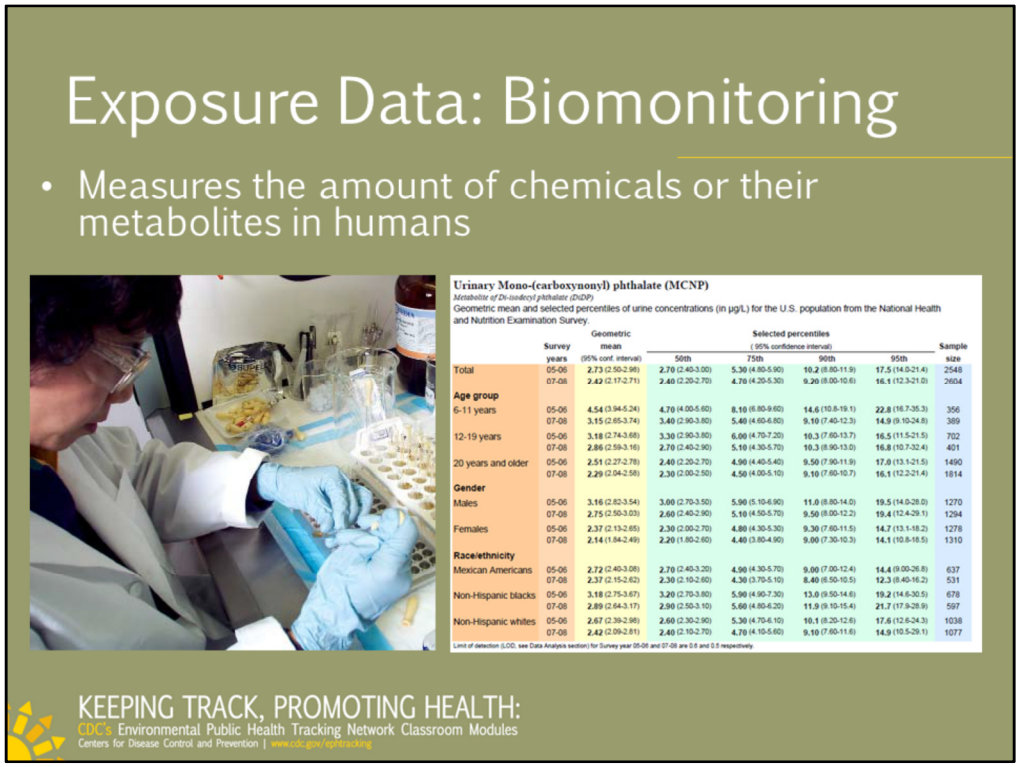
SOURCE: Nsubuga P, White ME, Thacker SB, et al. Public Health Surveillance: A Tool for Targeting and Monitoring Interventions. In: Jamison DT, Breman JG, Measham AR, et al., editors. Disease Control Priorities in Developing Countries. 2nd edition. Washington (DC): World Bank; 2006. Chapter 53. Available from: http://www.ncbi.nlm.nih.gov/books/NBK11770/

IMAGES:
- http://www.cdc.gov/osels/ph_surveillance/nndss/nndsshis.htm
- http://www.cdc.gov/brfss/
- http://ephtracking.cdc.gov/



OPTIONAL Activity: Research a public heath surveillance system and report back to the class.

- Provide an overview of the system.
- What data does it provide?
- What are the data sources? How are the data collected?
- What is the value to public health? How are the data used?
- Is there an example study that has been published using these data?



Epidemiology and surveillance measure the presence of disease in a population; biomonitoring is critical in measuring the impact of environmental exposure on individuals. Environmental chemicals are found in air, water, food, soil, dust, and consumer products. We know that some of them cause disease or illness in people; however, for most chemicals, we do not know if low level environmental exposures affect our health.

Scientists at CDC have been determining which environmental chemicals people have been exposed to by measuring how much of those chemicals actually get into people's bodies. This is called biomonitoring or exposure data. Most biomonitoring involves measuring the amount of a chemical or its breakdown product (metabolite) that is in a small sample of a person's blood or urine*. The amount of the chemical or metabolite in the blood or urine depends on the amount of the chemical that has entered the body from exposure pathways like eating, drinking, breathing, and touching. This amount represents the amount of a chemical that entered the body from all sources and through all exposure pathways combined.

These data cannot tell you how a person was exposed to a contaminant, and the level of contaminant in a person's blood or urine alone is not an indication of a disease. More research is needed to determine which levels of contaminants are safe and which result in disease.

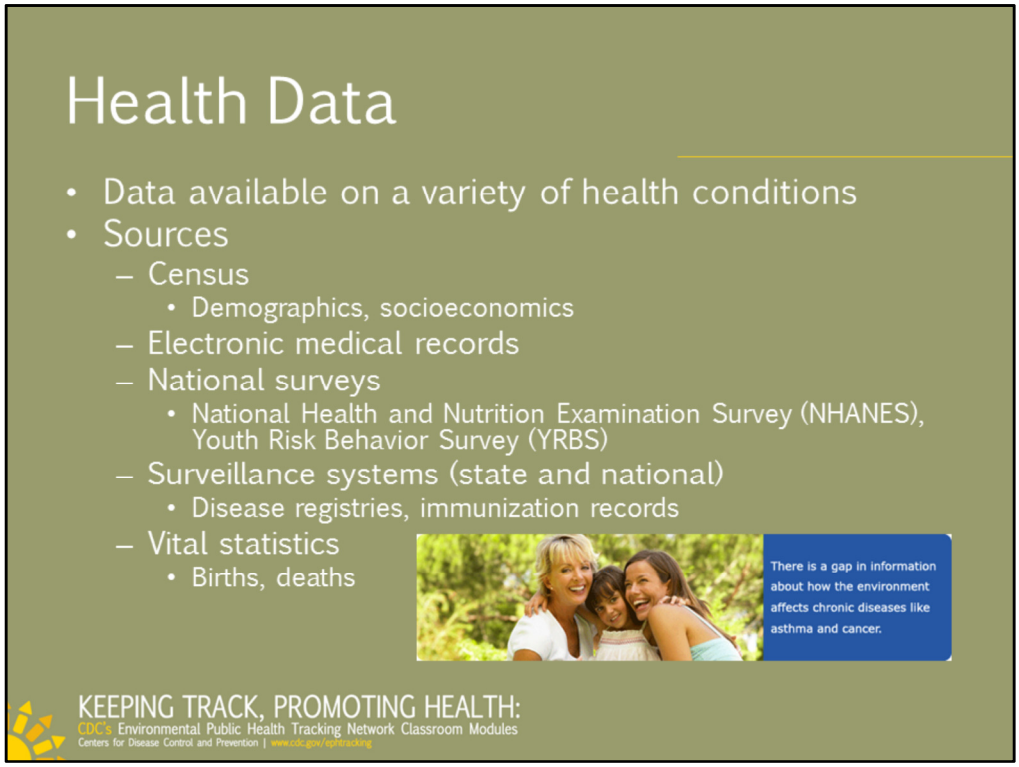
QUESTION: Who can name ways we are exposed to environmental chemicals?
ANSWER: Eating, drinking, breathing, and touching

Biomonitoring data cannot tell you how a person was exposed to a contaminant. And the level of contaminant in a person's blood or urine alone does not indicate that the contaminant caused their disease. More research is needed to determine which levels of contaminants are safe and which result in disease. You can see why links between environmental issues and public health are so complicated to explain.

NOTE: Other biological substances that may be used in biomonitoring include hair, nails, semen, breast milk, saliva, or adipose tissue (fat).

SOURCE:Table and image shown is from CDC's National Report on Human Exposure to Environmental Chemicals: http://www.cdc.gov/exposurereport

SOURCE: http://ephtracking.cdc.gov/showBiomonitoringLanding.action



Rich data exist on most health conditions—from chronic to acute illnesses to injuries and disabilities. These data come from a variety of sources including the census, electronic medical records, national surveys, surveillance systems, and vital statistics.

Some data are collected by state agencies and some by federal agencies. It can be very difficult to compare data collected by different groups because the data may not be collected or analyzed the same way. There may be privacy issues that prevent agencies from sharing data, especially health data.

IMAGE: http://ephtracking.cdc.gov/showHealthEffects.action

The main types of hazard data that systems contain include:

Site specific: When samples, observations, inspection reports or source/compliance tests are conducted at a specific location.

Facility data: Any facility that emits pollutants into the environment is required by law to keep detailed records of these emissions and to report them to the U.S. Environmental Protection Agency (EPA). Extensive hazard data are generated from internal records of these facilities and from their publicly available reports.

Environmental **monitoring** is periodic or continuous surveillance or testing. Data are gathered from fixed points within the environment (e.g., air monitoring stations, routine groundwater sampling, or monitoring of wells) to determine pollutant levels.

Modeling is a mathematical method using known information to make simulations, estimates, or predictions about a system or condition. For example, modeled air data are used to estimate levels of ozone and particulate matter in the air. These data are applied to areas that don't have air quality monitors and to fill in time gaps when monitors may not be recording data.
[SOURCE: Environmental Public Health Tracking 101 Online Course, Module 6]

So, where does this modeled air data come from? The EPA maintains a database called the Air Quality System. This system contains data from about 4,000 monitoring stations around the country. However, these monitoring stations don't operate all the time and are in only about 20 percent of the counties in the United States. Modeled air data statistically combine monitoring data from the Air Quality System with results from another EPA dataset called the Community Multiscale Air Quality model. Though it would be more desirable to have environmental monitoring data for more counties or have personal monitoring for measurement of the immediate and continually changing environment of individuals or populations; this is typically cost-prohibitive. [SOURCE and additional reading on monitored and modeled data: http://ephtracking.cdc.gov/showAirIndicators.action]

IMAGE: http://www.nature.nps.gov/night/measure.cfm

Hazard data, which various agencies collect, encompass data from environmental monitoring of sources such as air, water, soil, food, and vectors, as well as data derived from estimates, models, source measurements, calculations, and facility and other reports. A typical example of hazard surveillance is air pollution monitoring in a certain area. Many hazard data systems have been established and are already in use across the United States. These systems store information on a variety of possible hazards, from chemical spills to air pollution.

Air: The United States Environmental Protection Agency (EPA) has a repository of air quality data called the Air Quality System (AQS). This database contains measurements of criteria air pollutant concentrations in the United States. [SOURCE: Environmental Public Health Tracking 101 Online Course, Module 6]

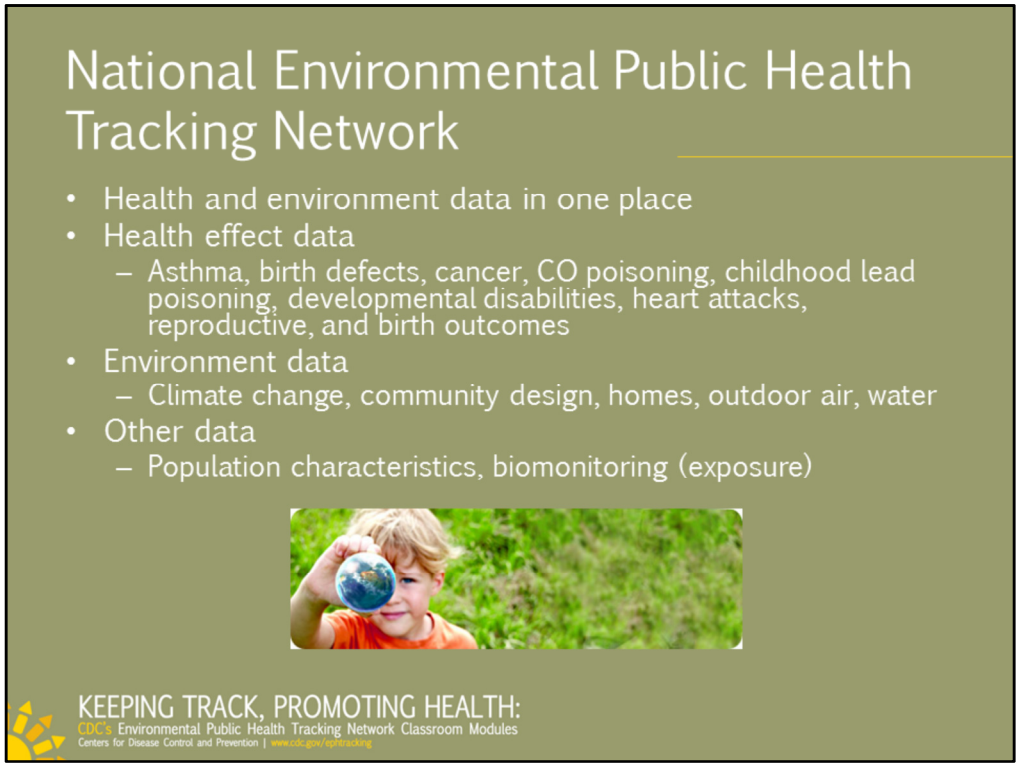
Water: An illustration of a water hazards database is the federal Safe Drinking Water Information System (SDWIS), an EPA database containing national information about public supplies of drinking water. [SOURCE: Environmental Public Health Tracking 101 Online Course, Module 6]

Soil or Sediment contamination: EPA also has databases that include information regarding the distribution and concentration levels of contaminants in soil and sediment. An example is the CERCLIS database. This is the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), and it contains information on hazardous waste sites (Superfund sites), potentially hazardous waste sites, and remedial activities across the nation. The database includes sites on the National Priorities List (NPL) or that are under consideration for the NPL. [SOURCE: Environmental Public Health Tracking 101 Online Course, Module 6]

Community Design: Community design refers to all the elements of a community that are human-made and form the physical characteristics of that community. It includes: buildings, such as schools, workplaces, and homes; roads; parks and recreation areas; transportation systems; and places to buy food. One data source example used for environmental public health includes results from the US Census Bureau's American Community Survey (ACS) (http://www.census.gov/acs/www/). The survey is conducted by the US Census Bureau in every county, American Indian and Alaska Native area, and Hawaiian Home Land. ACS collects data on demographic characteristics, family and relationships, income, health insurance, education, veteran status, where people work and how they get there, and homeowner status. [Source: Tracking Network, Community Design Module http://ephtracking.cdc.gov/showCommunityDesign.action]

Weather and Climate: Weather and climate have affected human health for millennia. Now, climate change is altering weather and climate patterns that previously had been relatively stable. Climate experts are particularly confident that climate change will bring increasingly frequent and severe heat waves and extreme weather events, as well as a rise in sea levels. These changes have the potential to affect human health in several direct and indirect ways, some of them severe. The National Oceanic and Atmospheric Administration (NOAA) collects temperature, precipitation, tropical cyclone intensity, and ocean conditions (e.g., sea level, temperature, acidity) data. [Source: CDC Climate & Health Program http://www.cdc.gov/climateandhealth/effects/default.htm]

IMAGES:
- http://ephtracking.cdc.gov/showClimateChangeLanding.action
- http://ephtracking.cdc.gov/showClimateChangeMonitoring.action
- http://www.cdc.gov/nceh/tracking/success/savinglives_massachusetts.htm



While we have great health data, there is a gap in what we know about how the environment affects chronic health issues. CDC's Tracking Network has data on health conditions and environmental hazards in effort to better understand the relationship between health and the environment.

IMAGE:
http://ephtracking.cdc.gov/showDevelopmentalDisabilitiesRelatedLinks.action

Clean Air Act: The 1990 Clean Air Act (CAA) (http://www.epa.gov/air/caa/) is the most recent version of a law first passed in 1970. The 1990 CAA amendments in large part were intended to meet unaddressed or insufficiently addressed problems such as acid rain, criteria air pollutants including ground-level ozone, hazardous air pollutants (HAPs)—also known as air toxics—and stratospheric ozone depletion. HAPs are those pollutants known or suspected to cause cancer and other serious health effects, such as reproductive effects and birth defects. Examples of six primary pollutants include PM, ozone (smog), CO, sulfur oxides, nitrogen oxides and lead. (For more information on air pollutants, visit: http://www.epa.gov/air/airpollutants.html)

Safe Drinking Water Act: Congress originally passed the Safe Drinking Water Act (SDWA) (http://www.epa.gov/ogwdw/sdwa/index.html) in 1974 to protect the public by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and includes many requirements to protect drinking water and its sources, such as rivers, lakes, reservoirs, springs, and groundwater wells. SDWA does not regulate private wells that serve fewer than 25 persons.

Clean Water Act: First enacted in 1972 and updated by many other laws in the years since, the Clean Water Act (http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45) includes a wide range of provisions to reduce surface water pollution. To reduce or eliminate contamination of water supplies, substances controlled by the Clean Water Act must be monitored and tracked.

These are just three examples – many more laws and regulation mandating data collection exist.

SOURCES and additional reading:

- U.S. Environmental Protection Agency. Clean Air Act. http://www.epa.gov/air/caa/
- U.S. Environmental Protection Agency. Plain English Guide to the Clean Air Act. http://www.epa.gov/air/caa/peg/
- U.S. Environmental Protection Agency. Safe Drinking Water Act. http://www.epa.gov/safewater/sdwa/basicinformation.html
- U.S. Environmental Protection Agency. Clean Water Act. http://www.epa.gov/regulations/laws/cwa.html
- HIPPA: http://www.hhs.gov/ocr/privacy/hipaa/understanding/index.html

IMAGES:

- http://ephtracking.cdc.gov/showDbpYourHealth.action
- http://ephtracking.cdc.gov/showAirLanding.action

OPTIONAL activity or assignment: Find another federal environment or health data law and share it with the class. Health Insurance Portability and Accountability Act (HIPAA), Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) are examples.

There are a number of stakeholders that have a role in environmental public health.

The federal government is actively monitoring and assessing environmental hazards and their effects on health through various agencies and programs. It is leading national outreach programs to communicate to the public about how to protect their health from specific environmental hazards, while also supporting state and local government efforts.

State and local governments are doing this work on a local level. They identify issues specific to their community based on monitoring and trends; research local hazards to better understand their health effects; respond to citizen environmental health concerns; and implement outreach programs to minimize the effect of known environmental risks, for example.

Health and environmental groups large and small are conducting their own research; lobbying elected officials for tighter regulations and new laws that protect citizens from hazards; and leading communications outreach programs to educate people about specific hazards and health effects. American Cancer Society, Coalition to Prevent Childhood Lead Poisoning, Environmental Defense Fund, Sierra Club, National Center for Healthy Homes, and Children's Environmental Health Network are just a few examples of groups studying the links between the environment and health.

Environmental Health is a growing field with expanding opportunities for public health professionals. Some of the areas environmental health professionals work in include medicine, environmental justice and ethics issues, and geospatial analysis (mapping).

SCIENCES

Environmental Health Specialist-Sanitarians: Sanitarians, or environmental health specialists, enforce government regulations and advise and educate clients. They also improve water and sanitation facilities and are involved in improving the quality of community environments.
Environmental Engineers: Research, design, plan, and perform engineering duties in the prevention, control, and remediation of environmental hazards using various engineering disciplines. Work may include waste treatment, site remediation, and pollution control technology.
Environmental Scientists: Environmental scientists study the issues affecting individuals, and wildlife and their surroundings. Duties might include measuring soil, monitoring waste, and preserving water supplies.
Epidemiologists: Study the causes, distribution, and control of disease and injury. They develop research protocols and design and conduct studies. They focus on the medical, social, and behavioral risks associated with disease and injuries.
Hydrologists: Hydrologists study bodies of water, including its quality and physical properties. These environmental specialists might check both regional and global water for safety.
Information Technology/Health Informatics Specialists: Health informatics is the systematic application of information and computer science and technology to public health practice, research, and learning. Health informatics specialists, in collaboration with public and private health partners, develop and evaluate approaches for standardizing, collecting, integrating, and sharing national health data and information systems.
Occupational Health and Safety Specialists: Occupational health and safety specialists check work environments for health hazards. Duties include checking ventilation, collecting air samples and inspecting machinery for workers' safety.
Statisticians and Mathematicians: Design surveys and experiments, collect, analyze, and interpret numerical data. Biostatisticians apply their skills in health-related fields.
Toxicologists: Toxicologists are responsible for identifying and classifying toxic substances. A toxicologist undertakes experiments, analyzes the results to discern toxic chemicals in the environment.

SOCIAL SCIENCES

Accountants*: Accountants prepare and examine financial records. They ensure that financial records are accurate and that financial obligations are paid properly and on time. Accountants assess financial operations and work to help ensure that organizations run efficiently.
Behavioral scientists (CDC): Behavioral scientists with expertise in sociology, demography, psychology, and anthropology conduct research on the transmission, treatment, and prevention of disease. They develop, implement, and evaluate programs and consult with public health officials.
Communication specialists*: Health communicators create and disseminate messages that help both individuals and groups understand health and illness.
Health educators (* and CDC): Health educators teach people about behaviors that promote wellness. They develop programs and materials to encourage people to make healthy decisions. They are involved in strategic planning, program implementation, monitoring, and evaluation.
Lawyers (http://legalcareers.aout.com/od/legalpracticeareas/a/Environmentallaw.htm): Environmental law is a broad practice area that encompasses a range of issues surrounding the environment including water and air quality, hazardous waste, species protection, agriculture, wetlands, biodiversity, waste management, and right-to-know laws. It also encompasses the handling, transportation, regulation, and cleanup of hazardous substances.
Political Scientists/Policy Analysts*: Political scientists study the origin, development, and operation of political systems. They research political ideas and analyze the structure and operation of governments, policies, political trends, and related issues. Policy analysts research issues, suggest solutions, and recommend policies to address those issues.
Public health economists (http://www.cdc.gov/mmwr/preview/mmwrhtml/su5502a7.htm): Conduct evidence-based research to help policy makers prioritize health problems, prevention and treatment options, and resource allocation. At CDC, economics is used to systematically identify, measure, value, and compare the costs and consequences of alternative prevention strategies.

CLINCAL PRACTICE

Nurses at all levels, physicians, and other health care providers. Specialties include:
Environmental medicine: studying the interactions between environment and human health, and the role of the environment in causing or mediating disease
Occupational medicine: prevention and management of illness, injury, and disability that is related to the workplace

RESOURCE:

CDC Career and Training Opportunities (commissioned corps, fellowships, student jobs, internships, volunteer service, etc.)
http://www.cdc.gov/employment/menu_cto.html

*SOURCE: Bureau of Labor Statistics

IMAGE (and job-search resource):http://www.neha.org/job_center.html

Let's talk about current events and how environmental health is reported in the media. As a future public health professional, it's important to understand how your work may be reported or interpreted by members of your community.

Have any of you read anything lately about how the environment may be affecting public health? What was the environmental hazard and exposure? What was the health impact? Who are the sources for information? Was the link between hazard and health condition reported as fact?

NOTE FOR INSTRUCTOR: Scan headlines and pull a recent article reporting on environmental health (perhaps in your state) to help make the connection and drive a discussion with students about the study of environmental health and how it is used and interpreted in the real-world. Have students read the article.

DISCUSSION PROBES: Is the article balanced? Accurate? What are the sources? Does it create public concern? Does science prove or suggest a link between hazard and health effect?

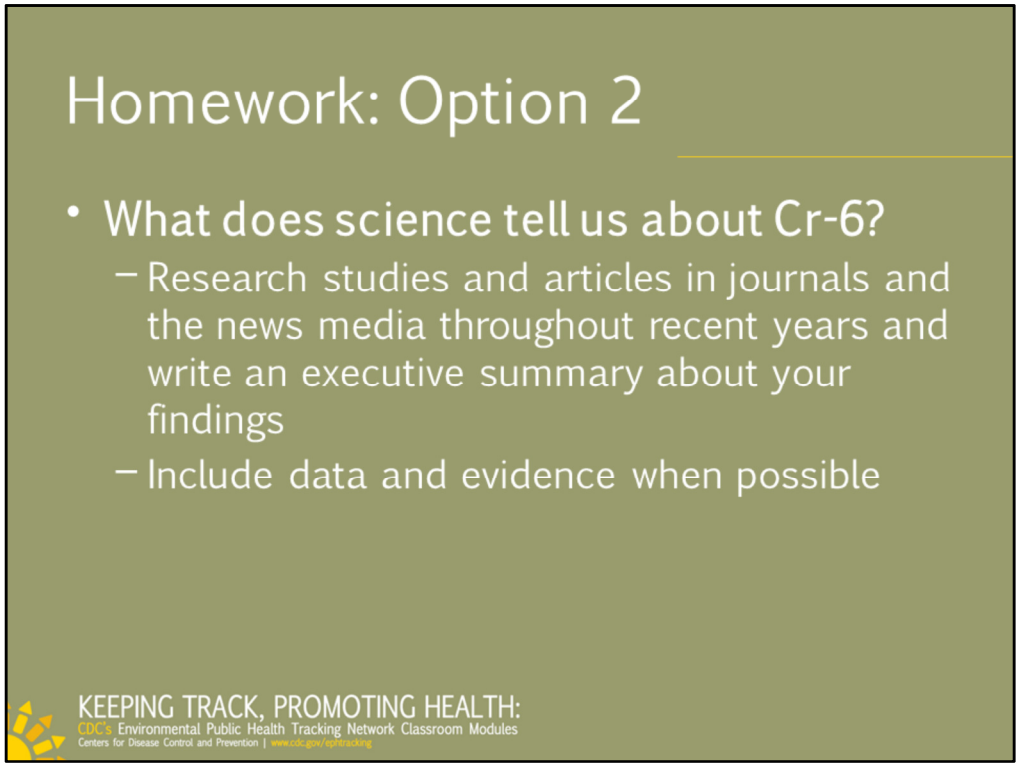
Or, ask some students to respond to the article as a member of the public might, and others to respond as a public health professional might, when first hearing about the issue. Then start a conversation about framing; how issues become politicized; what professionals need to know about the public's typical use of media; public reactions to health-related news; and how that all plays in to public health's goal to solve issues through individual behavior change, stronger regulatory policies, etc.

ARTICLE IDEAS:
http://www.scientificamerican.com/article.cfm?id=environment-and-our-health&WT.mc_id=SA_syn_huffpo
http://www.environmentalhealthnews.org/

Homework: Option 1

- What's your issue?
  - Choose an environmental health issue you care about
  - Research and read one recent news or journal article about a study related to this issue
  - Oral assignment: Summarize article, why is it important to know about this topic, and its impact on public health
  - Writing assignment: Three-to-four paragraph summary with analysis

KEEPING TRACK, PROMOTING HEALTH:
CDC's Environmental Public Health Tracking Network Classroom Modules
Centers for Disease Control and Prevention | www.cdc.gov/ephtracking



Or you can revisit the issue Erin Brockovich tackled.

What does science tell us about the link between Chromium 6 and cancer? Is it proven or suggested?

Research studies and articles in journals and the news media throughout recent years and write an executive summary about your findings and analysis. We'll discuss your findings during our next class.

NOTE FOR INSTRUCTOR: Relevant stories/studies may include:
http://thepumphandle.wordpress.com/2007/12/18/erin-brockovich-revisited/

- The data limitations acknowledged are particularly important to consider.

Tests find cancer-causing chemical in 89 percent of cities sampled:
http://www.ewg.org/chromium6-in-tap-water/executive-summary

A study released in 2010 by the California Cancer Registry showed that cancer rates in Hinkley (http://en.wikipedia.org/wiki/Hinkley,_California) "remained unremarkable from 1988 to 2008."[7]

An epidemiologist (http://en.wikipedia.org/wiki/Epidemiology) involved in the study said that "The 196 cases of cancer (http://en.wikipedia.org/wiki/Cancer) reported during the most recent survey of 1996 through 2008 were less than what he would expect based on demographics and the regional rate of cancer."[7]

Average Cr-6 levels in Hinkley were recorded as 1.19ppb with a peak of 3.09ppb (http://en.wikipedia.org/wiki/Parts_per_notation). The PG&E Topock Compressor Station averaged 7.8ppb and peaks at 31.8ppb based on the PG&E Background Study. [8] California's Public Health Goal (PHG), circa 2011, for hexavalent chromium is 0.02ppb.[9]

Additional reading to learn more about environmental health

Resources

- Associations
  - National Environmental Health Association, www.neha.org
    - Explore job descriptions: http://www.neha.org/job_center.html
  - American Public Health Association: http://www.apha-environment.org/
  - National Association of County and City Health Officials: http://www.naccho.org/topics/environmental/
  - Association of State and Territorial Health Officials: http://www.astho.org/programs/environmental-health/
  - American Nurses Association: www.nursingworld.org
    - Standards on Environmental Health Nursing Care and the Precautionary Principle
- Studies and reports
  - CDC's National Report on Human Exposure to Environmental Chemicals: www.cdc.gov/exposurereport
  - CDC's National Health and Nutrition Examination Survey: www.cdc.gov/nchs/nhanes.htm

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CDC's Environmental Public Health Tracking Network Classroom Modules
Centers for Disease Control and Prevention | www.cdc.gov/ephtracking

Thank You!

For additional details on CDC's National Tracking Network, visit www.cdc.gov/eph tracking

The findings and conclusions in this presentation have not been formally disseminated by the CDC and should not be construed to represent any agency determination or policy.

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